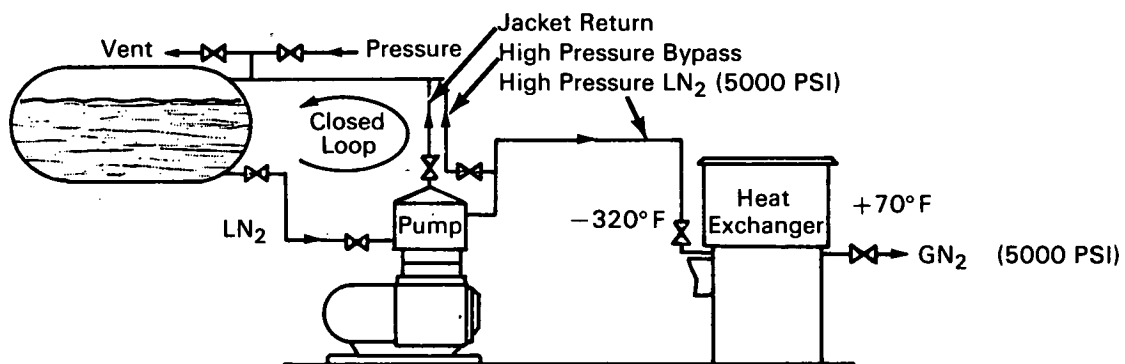


# NASA TECH BRIEF



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## Closed Loop Operation Eliminates Need for Auxiliary Gas in High Pressure Pumping Station



### The problem:

The liquid nitrogen high pressure pump requires a continual bleed to maintain the liquid nitrogen level in the suction reservoir and coolant jacket. In an open loop system the bleed valve is vented to the atmosphere and a separate gaseous nitrogen source is provided to maintain the tank pressure of the liquid nitrogen. The open loop system requires continuous operator attendance to prevent burnout, extensive temperature rise in the heat exchanger, and possible explosion.

### The solution:

A closed loop system in which the gaseous nitrogen generated in the pump and in the liquid nitrogen pipeline, due to heat leak, is fed back into the reservoir to maintain the pressure in the liquid nitrogen storage tank.

### How it's done:

The bleed lines from the pump and jacket return

are connected to the top of the LN<sub>2</sub> storage tank. The nitrogen gas that is generated by the pump and by the heat leak in the LN<sub>2</sub> pipeline is then utilized to maintain the pressure in the storage tank. The gas is no longer vented to the atmosphere, eliminating the requirement for auxiliary gas to maintain the tank pressure, making the operation more efficient and safer.

### Notes:

1. The closed loop method has been successfully applied to a relatively high (15 gpm) cryogenic pumping system.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B66-10408

(continued overleaf)

**Patent status:**

Inquiries about obtaining rights for the commercial use of the invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: D. G. Landy  
of North American Aviation, Inc.  
under contract to  
Marshall Space Flight Center  
(M-FS-893)